Excitation of Rydberg State in Magneto-Optical Trap

Mentor: Dr. Michael Noel

Magneto-Optical Trap (MOT) is useful in cooling and trapping atoms. The goal of our research is to trap and excite Rubidium atoms to Rydberg state using MOT and study the interactions and properties of the Rydberg atoms. Diode lasers are used as the light source in the experiment. Rubidium gas is kept in a vacuum cell in which magnetic field is applied and laser beams of specific wavelengths are shone in. Rubidium is in the alkali metal group, and therefore has one valence electron. The single valence electrons in the atoms are excited from ground state to Rydberg state by using near infrared lasers at wavelengths of 780 nm, 776 nm, and 1020 nm. Throughout the paths of the laser beams from light source to the trap, various optical devices are used for the stabilization and feedback of the lasers, which is critical in building the trap. Saturated absorption spectroscopy is used in finding and locking the lasers at resonant frequencies. Optic fiber connected to a wavemeter is set up to measure the wavelength of the laser beam. We are also building Fabry Perot interferometers to control the frequency of the lasers. After finishing building the MOT, we can run experiments to research on the properties of the excited Rydberg atoms.